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FEB 19 2013

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 50-388/2012-004-00
UNIT 2 LICENSE NO. NPF-22
PLA-6964

Docket No 50-388

Attached is Licensee Event Report (LER) 50-388/2012-004-00. The event involved a reactor scram and associated actuations. This event is being reported in accordance with 10 CFR 50.73(a)(2)(iv)(A) as a condition that resulted in automatic actuation of the reactor protection system.

There were no actual consequences to the health and safety of the public as a result of this event.

No regulatory commitments are associated with this LER.

Jeff M. Helsel

J. M. Helsel

Attachment: LER 50-388/2012-004-00

Copy: NRC Region I
Mr. P. W. Finney, NRC Sr. Resident Inspector
Mr. J. A. Whited, NRC Project Manager
Mr. L. J. Winker, PA DEP/BRP

NRC FORM 366 (10-2010)	U.S. NUCLEAR REGULATORY COMMISSION	APPROVED BY OMB: NO. 3150-0104 EXPIRES:10/31/2013
	LICENSEE EVENT REPORT (LER) (See reverse for required number of digits/characters for each block)	Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA/Privacy Section (T-5 F53), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects.resources@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

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4. TITLE **Unit 2 Automatic Scram Due to Low Reactor Pressure Vessel Level**

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER 05000
12	19	2012	2012	- 004	- 00	02	19	2013	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE 1

10. POWER LEVEL 18%

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMER *(Include Area Code)*
C. E. Manges, Jr., Senior Engineer - Nuclear Regulatory Affairs	(570) 542-3089

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
X	JB	ISV	W030 L200	Yes					

14. SUPPLEMENTAL REPORT EXPECTED		15. EXPECTED SUBMISSION DATE	MONTH	DAY	YEAR
☐ YES *(If yes, complete 15. EXPECTED SUBMISSION DATE)*	☒ NO				

ABSTRACT *(Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)*

At approximately 1731 hours on December 19, 2012, with the unit operating at approximately 18% power, Susquehanna Steam Electric Station Unit 2 automatically scrammed on low reactor pressure vessel (RPV) level (Level 3, +13 inches) while transitioning the 'A' reactor feed pump from discharge pressure mode to flow control mode. All control rods inserted and both reactor recirculation pumps tripped. Reactor water level lowered to approximately -29 inches causing Level 3 (+13 inches) isolations. There were no automatic Emergency Core Cooling System initiations. No steam relief valves opened during the event. All safety systems operated as expected.

The scram and associated actuations were reported in accordance with 10 CFR 50.72(b)(2)(iv)(B) and 10 CFR 50.72(b)(3)(iv)(A) in EN 48607 at 2029 on December 19, 2012. These events are also reportable as an LER in accordance with 10 CFR 50.73(a)(2)(iv)(A).

The root causes of the event were: 1) decision making without a formal evaluation of impacts that reflected a conditioned operator response and inadequate risk evaluation of activities and 2) missed opportunities to identify and provide compensation for the design of the integrated control system logic interface with the valve breaker power.

Key corrective actions included: 1) providing operator training, 2) providing an equipment reliability update to crews, 3) issuing an Operations directive to minimize the knowledge based decisions, 4) revising the Units 1 and 2 reactor feed pump operating procedures, and 5) placing caution signs on the applicable valve breakers indicating that opening the breakers impacts Integrated Control System (ICS) logic. Key corrective actions planned include: 1) defining operator specific skill of the craft work activity actions in an Operations administrative procedure, 2) implementing changes to the station procedure use and adherence procedure, and 3) creating new or revised guidance on the need to identify actions to respond to or compensate for single point vulnerabilities.

There were no adverse consequences to the health and safety of the public as a result of this event.

NARRATIVE

EVENT DESCRIPTION

Initial Plant Conditions/Status of Structures, Systems, and Components

At the time of the event, the unit was synchronized to the grid and operating at 18% power. The 'A' Reactor Feed Pump (RFP) [EIIS System Code JB] was the operating RFP. The 'B' RFP was in standby. Operators attempted to shift operating modes for the 'A' RFP from the Discharge Pressure Mode (DPM) to the Flow Control Mode (FCM) for level control using the Integrated Control System (ICS) [EIIS System Code: JB] in the automatic mode. The transfer did not function as expected due to the 'A' RFP discharge valve (HV20603A) staying closed. The valve should have opened for the 'A' RFP FCM step to complete. The reactor was stable and reactor water level was being maintained within the normal operating band. There were no control room alarms associated with the FCM transition in auto not completing as intended by the procedure.

The operators discussed the plant conditions, reviewed the work order record for a similar event in August 2011 and decided to: 1) open the HV20603A valve breaker, 2) manually adjust the valve, 3) stroke the valve open, 4) complete the flow control step, and 5) continue with the operating procedure steps.

The RFP discharge valve breaker was opened twenty one minutes after the 'A' RFP failed to complete the transfer to the FCM. No procedure change was processed and a formal risk assessment was not completed that could have moved the decision from knowledge based to rule based. The equipment operated in accordance with the plant design following the breaker being opened. The transient response procedure used, and the actions taken per the response procedure did not mitigate the feedwater level transient.

No equipment, other than that discussed above, was inoperable at the start of the event that contributed to the event.

Description of the Event

At approximately 1731 hours on December 19, 2012, Susquehanna Steam Electric Station Unit 2 automatically scrammed on low RPV level (Level 3, +13 inches) while transitioning the 'A' reactor feed pump from DPM to FCM. All control rods inserted and both reactor recirculation pumps tripped. Reactor water level lowered to approximately -29 inches causing Level 3 (+13 inches) isolations. There were no automatic Emergency Core Cooling System initiations. No steam relief valves opened during the event. All safety systems operated as expected.

The following is a timeline of events associated with the scram:

Restart of Unit 2 was occurring on 12/19/2012 following an automatic scram on 12/16/2012

12/19/2012 at 1709 hours – Operations attempted to place the 'A' RFP in FCM (Valve control in AUTO). HV20603A failed to open after 2 minutes as expected. The valve was assumed to be thermally bound. A decision was made to send an operator to open the breaker for HV20603A and manually unseat the valve.

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12/19/2012 at approximately 1730 hours – The breaker for HV20603A was opened causing the valve position limit switches to be deenergized. ICS, per design, interpreted the loss of position indication as valve OPEN indication. With valve control in automatic, the design initiated the remainder of the process for placing the feedpump in FCM, and ICS closed HV20651A and the feedwater LV20641.

The HV20603A and LV20641 valves being closed simultaneously isolated feedwater flow to the reactor vessel causing a decrease in reactor vessel level. The 'A' RFP speed increased in response to the lower level. The difference in the closing time between the HV20651A and LV20641 valves allowed the RFP header upstream of LV20641 to pressurize.

Attempts to place the standby pump in service were unsuccessful and vessel level continued to decrease.

12/19/2012 at 1731 hours - The automatic SCRAM occurred when level reached 15 inches, just prior to the operator completing the action to take the mode switch to shutdown. A subsequent recirculation pump trip occurred and was expected based on the instrument setpoints established in accordance with the calibration procedure.

12/19/2012 at 1745 hours – The feedwater system was restored when Operations placed 'A' RFP in DPM and established level band of +45 to +50 inches.

12/19/2012 at 1748 hours - Operations reset the reactor scram.

Reporting Criteria

The scram and associated actuations were reported in accordance with 10 CFR 50.72(b)(2)(iv)(B) and 10 CFR 50.72(b)(3)(iv)(A) in EN 48607 at 2029 on December 19, 2012. These events are also reportable as an LER in accordance with 10 CFR 50.73(a)(2)(iv)(A).

CAUSE OF THE EVENT

Direct Cause

The direct cause of the decision to open the HV20603A valve breaker and the event was the failure of the HV20603A valve to open as requested by automatic controls. This initiated the sequence of events that led to the scram. Subsequent diagnostic testing of the valve actuator did not show any actuator performance issues. A valve internal inspection is planned during the next refueling outage to check for any abnormal conditions within the valve.

Root Causes

1. The decision to open the HV20603A valve breaker was made without a formal evaluation of impacts (Knowledge Based decision) that reflected a conditioned operator response and inadequate risk evaluation of activities.

   When faced with a motor-operated valve (MOV) that appears to be stuck in its seat, it is an Operations conditioned response to attempt to free the valve manually. Based on vendor operating experience, the power breaker for the valve is opened before the attempt to move the valve using the hand wheel to prevent an injury to the operator once the valve is free as the valve movement could cause the hand wheel to strike the operator.

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2. Opportunities were missed to identify and provide compensation for the design of the ICS logic interface with the valve breaker power.

   The HV20603A valve had stuck previously in August 2011, and the operating crew had knowledge that the breaker had been opened previously to resolve the issue without a feedwater level transient occurring. On that previous occasion, MANUAL valve control was selected in ICS prior to opening the valve breaker. The lessons learned from the previous event had not been captured in the corrective action program (CAP) and the problem with the valve sticking had not been corrected. On December 19th, the valve control for ICS was left in automatic and the breaker was opened.

ANALYSIS/SAFETY SIGNIFICANCE

Actual Consequences:

Opening of the breaker for the HV20603A with the valve closed and with valve control for the "A" RFP in AUTO resulted in ICS closing the HV20651A and LV20641 valves isolating feedwater flow to the Reactor Vessel. One channel of recirculation pump trip logic actuated causing both reactor recirculation pumps to trip and challenging operators with vessel stratification. No cooldown limits were exceeded and a reactor recirculation pump was restarted to provide core circulation.

Although the scram challenged operators, the safety consequences of the event were bounded and non-limiting as described in UFSAR Chapter 15. All control rods inserted in response to the scram, and reactor water level lowered to -29 inches before the Feedwater Level Control System (FWLCS) recovered it automatically causing Level 3 (+13 inches) isolations as expected. RCIC and HPCI were not required to start, and remained in standby. All isolations and initiations at this level occurred as expected. No steam relief valves opened thereby negating any radiological consequences as described in the UFSAR. Reactor pressure was controlled by the turbine bypass valves. All safety systems operated as expected.

Potential Consequences:

FWLCS automatically realigned to the Start Up Level Control (SULC) mode recovering level such that RCIC and HPCI use were not required. If the FWLCS had failed to recover reactor level, RCIC and HPCI would have started to recover level as described in the UFSAR. This is within the UFSAR analysis for Loss of Feedwater events

All safety systems operated as expected; therefore the potential consequences of this event were mitigated.

The Unit 2 risk significance and potential consequences for the initiating event experienced on December 19, 2012 due to a loss of feedwater was less than 1E-06 for Core Damage Probability (CDP) and 1E-07 for Large Early Release Probability (LERP) significance thresholds as outlined in NRC Inspection Manual Chapter (IMC) 609. These thresholds represent a GREEN significance level and are of "Very Low Safety Significance."

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CORRECTIVE ACTIONS

Key corrective actions include:

1. Phase 1 Operator Briefings were completed by a member of the Operations management team and included briefing operating crews on expectations and standards with emphasis placed on avoiding actions in knowledge-based space. Crews involved in the start-up received the training prior to start-up. Phase 2 operator training provided the licensed operators a simulation of the two recent low level scrams.
2. An equipment reliability update was provided to the crews by a member of the senior leadership team.
3. As an interim action, an Operations directive was issued prior to startup to minimize the knowledge based decisions operators would be making due to equipment challenges.
4. The Units 1 and 2 RFP operating procedures were revised for placing the RFP into FCM to address not completing in AUTO.
5. Operator specific skill of the craft work activity actions will be defined in the applicable Operations administrative procedure.
6. The station procedure use and adherence program will be changed to ensure any actions taken (beyond skill of the craft) to resolve activities that cannot be performed as written or that produce an unexpected result require risk assessment prior to completing the action and require documentation of the specifics of the interim or compensatory action taken in the corrective action program. The intent of this step is to ensure that any plant manipulations (beyond skill of the craft) have controlling documents and have been risk assessed. Furthermore, that any actions required, or taken, to return to process/procedure are documented in CAP.
7. Caution signs were placed on the applicable valve breakers indicating that opening the breakers impacts ICS logic.
8. The guide for Failure Modes and Effects Analysis will be revised or a new guide will be developed to provide instructions and guidance for specific actions to take in response to identified effects (in particular, the need to identify actions to respond to or compensate for single point vulnerabilities).

PREVIOUS SIMILAR EVENTS

Susquehanna has had four previous scrams related to ICS. These events were as follows:

LER 387/2010-002-00, 01, and 02 – “Automatic Reactor Scrams Occur During Post-Modification Testing of the Digital Feedwater Integrated Control System”

LER 388/2011-003-00 – “Unit 2 Scram Due to Main Turbine Trip During ICS Testing”

LER 388/2012-002-00 – “Unit 2 Manual Scram Due to Loss of the Integrated Control System”